



Clean*Fleet*

FINAL REPORT



December 1995

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EMPLOYEE ATTITUDE ASSESSMENT

The experiences of couriers, operations managers, vehicle handlers (refuelers), and mechanics who drove and/or worked with alternative fuel vehicles, and the attitudes and perceptions of people with these experiences, are examined. Five alternative fuels studied in the CleanFleet project are considered: compressed natural gas, propane gas, California Phase 2 reformulated gasoline, M-85, and electricity. The three major areas of interest include comparative analysis of issues such as health, safety and vehicle performance, business issues encompassing several facets of station operations, and personal commentary and opinions about the CleanFleet project and the alternative fuels. Results of the employee attitude assessment are presented as both statistical and qualitative analysis.

Introduction

The experience and attitudes of FedEx employees who participated in the CleanFleet alternative fuels demonstration was documented. The “Employee Attitude Assessment” was conducted for Battelle by Braun & Associates. Results are summarized in four parts in this volume of the CleanFleet Findings.

First, the methodology used to elicit employee attitudes and assess them is presented. Second, a comparative analysis of attitudes is presented for three topics: health, safety, and vehicle performance. Next, attitudes about six operational issues are presented. Finally, personal commentaries are presented. This information provides insight into the attitudes of fleet employees about using alternative motor fuels.

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Methodology

Three data collection methods were utilized in this study: printed questionnaires, personal interviews, and focus groups. Each of these methodologies is explained below. It is important to note that any exploration of employee attitudes, by its very nature, involves a level of trust between the parties. To generate as much candor as possible, anonymity was guaranteed to all respondents.

Total Study Population

Four employee groups define the total study population: *couriers* who drove the vehicles; *operations (ops) managers* who were responsible for the personnel and routes where the CleanFleet vans were in service; *mechanics* who maintained and serviced the CleanFleet vehicles; and *handlers* who fueled the alternative fuel vehicles (AFVs). The procedures and schedule for access to all employees participating in the attitude assessment study were coordinated with each station's senior management to ensure minimal disruption to station operations.

The personnel involved with the CleanFleet demonstration are tallied in Table 1. A database was compiled from the CleanFleet vehicle/courier activity database (daily logs) and from names of operations managers, mechanics, and handlers supplied by FedEx. The vehicle/courier activity database was used to identify all FedEx couriers who drove CleanFleet vehicles at least 100 days between the start of the demonstration in April, 1992, and June 6, 1994.

Table 1. Total Study Population

Site: <i>Fuel</i>	Courier	Sr Mgr	Ops Mgr	Mechanic	Handler	Total Population
Irvine: CNG	47	1	2	2	3	55
Culver City: <i>electric</i>	16	1*	3*	1	1	22
Los Angeles: RFG	51	2	2	2	2	59
Rialto: <i>propane gas</i>	39	1	2	2	2	46
Santa Ana: M-85	45	1	1	1	1	49
TOTALS	198	6	10	8	9	231

* Culver City station and operations managers who were involved with the CleanFleet for the majority of the demonstration have been transferred to other sites.

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Printed Questionnaire

The printed questionnaire (survey instrument) was designed to gather generic quantitative data from all four employee groups in the total study population. This total population had a wide variance of involvement with CleanFleet vehicles and operations. The questionnaire was designed to be general enough that all respondents had the experience necessary to answer the questions fully.

The survey instruments were provided to each station manager with instruction to distribute them to all FedEx personnel who met the selection criteria identified on page 3. The data collection instrument was designed to allow direct comparison of attitudes between and within each of the four employee groups (couriers, operations managers, mechanics, and handlers), and required between 10-15 minutes to complete. The printed questionnaire is in Appendix A.

Distribution and responses received per station are shown below:

STATION	DISTRIBUTION ¹	RESPONSE	PERCENT
Irvine	60	52	87
Culver City	30	0*	0*
Los Angeles	60	10	17
Rialto	50	36	72
Santa Ana	50	16	32

* Because of the relatively few participants at Culver City, questionnaires were not distributed. However, personal interviews were conducted with all available personnel.

Interviews and Focus Groups

One-on-one interviews and focus group sessions were conducted with FedEx employees who met the criteria outlined below. Topics discussed were fuel-specific and vehicle-specific by site. The basic format for content explored during these one-on-one sessions is shown in Appendix B.

Site-, fuel-, and job position-specific attitude assessment presented the opportunity to concentrate on the individual characteristics of each fuel/vehicle technology. It accommodated exploring the problems and profiles of driving and working with these vehicles on a daily basis. However, because each site was dedicated to a specific fuel, personnel had no comparative experience with more than one alternative fuel.

¹ Distribution numbers indicate the number of printed questionnaires requested by and supplied to the senior station manager. The discrepancy between the distribution numbers and the smaller "Total Estimated Population" shown in Table 1 reflect couriers who may have driven CleanFleet vehicles for fewer than 100 days and/or who joined FedEx as employees between June 6 and October, 1995, and who had experience with the CleanFleet vehicles.

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Courier Interviews and Focus Groups. Candidates for the Sample Courier Population at all stations except Culver City were selected from the data in the CleanFleet vehicle/courier activity database (daily logs), based on the following selection criteria:

- Total AFVs driven (all models): 90 days minimum
- Last date AFV driven: After January 1, 1994
- Drove both control vehicle and AFV
- Drove unleaded (control) vehicle: 20 days minimum
- Single AFV driven (any model): Minimum days
 - Irvine: Over 60
 - Los Angeles: Over 50
 - Rialto: Over 26
 - Santa Ana: 30

With the number of CleanFleet couriers varying per site, the last criterion was established to gain a balanced, manageable sample of the total courier population from Irvine, Los Angeles, Rialto and Santa Ana stations. At Culver City, because of the small total population involved in the CleanFleet, all personnel with electric vehicle experience were considered candidates for one-on-one study. FedEx did not participate in the selection process.

The total sample courier population further was divided randomly into two subsets to participate in either focus group or one-on-one interview sessions, based on a balance of experience and number of days involved with the CleanFleet. The either/or methodology was designed to eliminate duplication, reduce the intrusion on a courier's time, and provide comparisons between individual and group dynamics within FedEx's courier culture. Table 2 summarizes the original courier sample population.

Table 2. Courier Sample Population Selection

Site: Fuel	Couriers			Interviews	Focus Groups
	Total	%	Sample		
Irvine: CNG	47	39	18	9	9
Culver City: electric	16	100	16	8	8
Los Angeles: RFG	51	40	20	10	10
Rialto: propane gas	39	41	16	8	8
Santa Ana: M-85	45	32	14	7	7
TOTALS	198	43	84	42	42

Other Interviews. Each senior station manager designated the operations managers, mechanics, and handlers to be interviewed at the five sites, based on their responsibility and involvement in CleanFleet operations over the term of the demonstration. All questions asked of the couriers, where appropriate, were

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asked of these populations as well. The same opportunities and restrictions applied. Position-specific discussion differentiated the personnel interviews, as shown in the Interview/Focus Group Format (Appendix B).

Station Manager Focus Group. The original plan was to include all six senior station managers (the Los Angeles facility consists of two stations operating side-by-side) in a single focus group to bring all five alternative fuel experiences together in an interactive environment. However, during the on-site sessions, it became clear that the operations managers were the principal management contact and that several of these senior managers were not involved in the demonstration's daily operations. Furthermore, it was determined that the logistics of coordinating a meeting during the peak holiday period would be an unproductive intrusion and interruption.

Comparative Analysis

This discussion compares three dominant attitude issues (health, safety, and vehicle performance) that emerged among the study population for the five alternative fuels tested in the CleanFleet. All data gathering instruments are considered in this multi-fuel attitude analysis. Unless otherwise noted, quotations are used to illustrate majority opinion.²

Several attitudes permeate the entire FedEx culture and one, in particular, deserves mention here: the professional self-image of each employee group surveyed in this study. The great majority of these individuals consider their work as a professional career, not just a job. Furthermore, and perhaps surprisingly, this is a more mature work force than might be expected in this industry. Thirty-three percent of the total study population was over 35 years of age, with another 23 percent between the ages of 31 and 35. Over 68 percent of this population has been employed in their current positions at FedEx for over 2 years. In most instances, it was clear that the opinions expressed were carefully considered and presented with sincere concern and personal commitment.

It is also important to note that in all employee groups at the five demonstration sites, the predominant consensus was that the CleanFleet demonstration program was important and worthwhile. There was an urgent support and active concern for air quality improvement, with a strong sense of pride that FedEx had taken a lead in the clean air field. Public and customer response was unilaterally positive, and the couriers reported enjoying the public's comments and questions.

Health

Employees at all stations, even those who reported specific health reactions, believed that the introduction of the CleanFleet alleviated the discomfort from fumes during the morning and evening "sorts"—the periods when the vehicle engines are running inside the station facility. The employees commented extensively on the fumes and exhaust difficulties that existed before the CleanFleet program, and the fact that the current unleaded gasoline and/or diesel fuel vehicles pose a problem in the enclosed facility, even though the facility is well-ventilated. This awareness of the indoor air quality was particularly strong in Irvine and Rialto, the two stations that underwent extensive ventilation system and duct work to prepare for the AFVs.

Questionnaire responses received from four of the five FedEx CleanFleet stations indicated that 15 employees (14 percent) reported specific health-oriented problems directly related to the alternative fuels in the demonstration.³ Table 3 illustrates the percentage of employees at each station and the problems they experienced.

² The variety of opinions and perceptions that emerged in this study are indicative of and inherent in the nature of attitude assessment studies. Minority opinions have been included in this report, where appropriate to indicate the breadth and depth of divergent attitudes.

³ Because of the limited number of employees involved in the CleanFleet program, questionnaires were not distributed at the Culver City (electric vehicles) station.

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Table 3. Health Issues

“During the CleanFleet Demonstration, did you experience a health-related problem that was due to the alternative fuel?”

Site: Fuel	Response	Experienced Problem		If Yes, What?*				
		Yes	No	Fuel Vapor	Exhaust	Headache	Skin Irritation	Eye Irritation
Irvine: CNG	48	6%	94%	4%	4%	2%		
Los Angeles: RFG	10	30%	70%		30%			
Rialto: propane gas	33	12%	88%	9%		6%	3%	
Santa Ana: M-85	16	31%	69%	25%	19%	19%		19%
AVERAGE	107	14%	86%					

* Respondents could mark more than one.

OTHER: M-85—Nose Bleeds 1 (6%)

It is interesting to note that the data indicate a negative reaction in 30 percent or more of the populations that worked with RFG and M-85 fuels, while less than half that percentage reported health problems from CNG and propane gas (6.3 percent and 12.1 percent, respectively). As noted above, however, the CNG and propane gas stations underwent extensive ventilation system modifications prior to using alternative fuel vehicles, while the RFG and M-85 stations did not. Personal interviews and focus groups corroborated that RFG at Los Angeles and M-85 at Santa Ana elicited the most negative health-oriented reactions to fumes and exhaust. During the one-on-one sessions, those individuals who experienced any ill-health reaction to propane gas usage at Rialto also described the effects in far more negative terms, citing headaches, skin irritation, and reactions to fumes. Electric vehicles posed no health problems per se. The only health concern expressed by the Culver City interviewees involved the unknown effects of the placement of a container to capture the trail end of battery fluid or acid under the vehicle.

At Irvine, most employees believed that the CNG vehicles and ventilation system significantly improved the air quality within the facility, although the consensus was that even the CNG fumes “would get really bad, once in a while, like during the summer.” The ventilation system installed at Irvine, when operating, helps to remove the exhaust fumes, but it was remarked that “we wouldn’t need the ventilation system if we had all CNG.”

With 30 percent of the Los Angeles station population reporting ill effects from RFG exhaust, the exhaust and fuel odors met with mixed reactions from the focus group and interviewees. For those employees who perceived that the air quality in the station was improved over the fumes emitted by the standard trucks, comments included, “It wasn’t so stifling, so claustrophobic with the CleanFleet. It wasn’t so irritating to my eyes and I wasn’t sitting there coughing like I used to in the morning. I could definitely tell the difference.” As many reported that the RFG smelled “different; it smelled worse” as those who could not recall the smell or any difference attributed to the use of RFG.

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Some couriers could not distinguish between propane gas and regular fuel and noticed no significant air quality improvement in the facility. For those who recognized the “perfume” but complained of no health effects, it was neither pleasant nor unpleasant. It was just “there” and dissipated faster than gasoline. This was noticeable inside the station, not on the road. Only one courier markedly objected to the odor, and one mechanic noted that “if the (vehicle fuel delivery) system is not running properly, you will definitely notice the fumes are very pungent, very ugly smelling from propane gas.”

M-85 elicited the greatest divergence in points of view, and the negative health effects were more intense than with any other alternative fuel. A pregnant courier at Santa Ana was grateful for the improvement in gas fumes due to the M-85. Other responses that indicated no ill effects still remarked on the smell as “sweeter” and irritating to the eyes, but less noxious. The smell of the M-85 would linger a little longer. One courier, in particular, could not perceive any difference, while another (who had no health issues) thought it “stunk.” However, the focus group reported headaches and burning and watering eyes, nose and throat, to the extreme of nose bleeds for one courier. Another female courier described it as “anything like a membrane would start to burn” directly in response to exposure to the M-85 exhaust. These reactions would last anywhere from five to fifteen minutes once the individual was exposed to fresh air. One handler mentioned that “some of the people felt real reluctant to refuel, afraid of what it would do to their skin; some people complained of nausea after just being around it.” At Santa Ana, three of the six focus group participants agreed that they would have liked to have known more about what the long term health issues were. They voiced their concern that these needs were not addressed in any of the training. There was general agreement that, once the problem was identified, there should have been some feed-back for the drivers, “especially when they realized a lot of couriers were complaining about eye irritation.”

Safety

When the concept of fuel safety was introduced in general terms during the focus groups and interviews, there appeared to be minimal reaction or concern. However, questionnaire data indicated apprehensions at all stations except Los Angeles, where a lack of safety concern held true for RFG throughout all phases of the research. Because of this differential, the general discussion was followed up with specific issues that emerged in the questionnaire data during the CNG, electric, propane gas, and M-85 one-on-one sessions. This in-depth discussion qualified these safety concerns, some of which were experiential and others were unresolved assumptions and anxieties.

Even for those who disclaimed any fear, an initial sense of caution was common at all stations and attributed to the novelty of the fuels. Getting used to being around them and receiving information about the fuels seemed to alleviate any apprehension for many employees. This general attitude across all fuel types is captured by the following courier’s remarks concerning CNG:

“At first, there was some concern. Not everybody is as careful as I am. And I could be 100 yards away and still be affected if something blows. But you get used to it. *Did you get used to it or did you realize there was no reason for concern?* I guess it’s like having gasoline in the ground; it has to be treated with care. I guess it’s no more hazardous than gasoline.”

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In another instance of concern in the early phases of the electric vehicle demonstration at Culver City, the vehicle “die out” issue and battery fluid collection in the station both caused some alarm. The courier who was driving the electric van assigned to the station at the time of the interviews (November, 1995), however, had experienced none of these problems and appeared to harbor no fear whatsoever.

Specific instances of safety issues involving M-85 and CNG occurred during the term of the demonstration that could have generated anxiety but, interestingly, did not. At Santa Ana, the two M-85 vehicles that caught fire did not evince an emotional response from the employees. As two Santa Ana couriers put it:

“I know there was a little problem with the one catching on fire. I thought, well, as long as they correct it, okay.” *Did you think it was the fuel or just a truck with a problem?* “I wasn’t sure. If there were a way to tell ahead of time, if there were signs you could see. I guess I did think about it. They said they fixed it, and I believed that. When my truck died on me toward the end of the program, 5-6 months ago, I thought well, they solved that problem so nothing is going to happen here. That there’s not going to be a fire. I felt safe.” *...Other than the fire, any other safety concerns?* “Not really. I didn’t feel in danger ever. That was never a concern.”

“We were prepped pretty good about it, as far as what to expect of the vehicles, the fueling. I don’t think there ever was any safety concern to worry about.”

The courier whose vehicle was heavily damaged by fire described his reaction most effectively:

“Other than that, I liked the vehicles. I didn’t have any problems. I didn’t want people to think I had done something to that vehicle, so I was a little shy to drive them again. But otherwise, no problems.”

The media-publicized story about a CNG fuel tank rupturing on a GM Sierra pickup truck had an immediate but short-lived impact. As one operations manager explained: “Everybody was all worried. We had to get information that these tanks were made by a different company, and here’s how you shut the fuel off if you have an emergency. If you feel threatened, just get away from it. I’ve had a few people comment that, now that the test is over, ‘You’re not going to take my truck away, are you?’ They’re comfortable with it.”

The differential between general safety concerns and specific perceived risks was most evident with propane gas. The majority of individuals at the Rialto station responded similarly when queried in general terms about safety concerns, as shown in this montage of responses:

“No. It’s just safe as any other fuel. ...No. ...Never. When the program first started, that was the only time the subject was really discussed. Once I saw them fuel the vehicles and the procedure, I didn’t ever have that consideration. ...No. ...No. ...No. I came into the program when it was already established. I was assured it was a safe system.”

The majority of Rialto focus group participants, however, clearly articulated their trepidation when discussing the performance characteristics of propane gas vehicles, including stalling, sputtering, and lack of

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acceleration (“You’d go to pull out and be scared”) and lack of range (“I would hate to run out of gas in a bad area. That’s a nightmare.”). Closer examination exposed that multiple propane gas safety issues, from the tanks located at the rear of the vehicle, to leaking fuel, to a sense of insecurity from lack of information about the safety of the system were troubling to specific individuals. This general feeling of disquiet was exemplified by one courier’s remark:

“There are so many problems that can go wrong with the propane gas. I noticed my truck, something froze up. I had a leak. You get into an accident with that leaking, I would think the truck would just blow up. As far as the tank being exposed, the tank is so big. All that propane gas in them. You would think it would be a serious problem.”

Several safety concerns were model-specific, resulting from body and cab design or mechanical features not related to the alternative fuel system. These responses did not reflect on nor were they caused by the alternative fuel and are not included here. Table 4 presents the experiential issues that emerged from the questionnaire responses.⁴

Table 4. Safety Issues

“During the CleanFleet Demonstration, did you experience a safety-related problem that was due to the alternative fuel?”

Site: <i>Fuel</i>	Station Response	Experienced Problem		If Yes, What?						
		Yes	No	Leak	Noise	Brake	Accel	Stall	Fire	Fuel Delivery
Irvine: CNG	48	25%	75%	15%	6%	6%				
Los Angeles: RFG	10		100%							
Rialto: propane gas	33	33%	67%	6%		6%	6%	15%		
Santa Ana: M-85	16	25%	75%						19%	6%
AVERAGE	107	25%	75%							

During the focus groups and interviews, it became apparent that the questionnaire data only provided a partial insight into the safety concerns of the respondents, mainly because the FedEx employees initially perceived the problems they experienced as *performance* issues. As the conversations evolved in the one-on-one sessions, these issues assumed safety-related dynamics. The fuel-related safety issues that were dis-

⁴ Because of the limited number of employees involved in the CleanFleet program at the Culver City station, questionnaires were not distributed at this location. Personal interviews provided data regarding safety issues with electric vehicles.

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cerned during the interviews and focus groups as the most pervasive or elicited the most emotional response are discussed below. It is important to recognize that, the validity of these concerns notwithstanding, no employees felt that the threats were severe enough to cross over the line from apprehension to a perception of imminent danger.

Acceleration. During the focus groups and interviews, concerns about lack of or under-acceleration crossed three fuel groups. CNG vehicle couriers laughed nervously when describing getting on the freeway or getting out of the way of a truck. Electric vehicle couriers worried about traffic and “you want as much room as possible just in case acceleration isn’t as fast as you’re used to” and “If you make a left turn with traffic coming in the opposite direction, you need to have plenty of room.” Similar comments were attributed to the propane gas vehicles: “If you try to jump into traffic, you won’t make it. If you take your foot off the gas and try to get back into it, it will absolutely fall on its face and almost stall.” *Once the (valving) problem was solved...?* “Jumping out into traffic, you can’t do it. I don’t think they can fix it. That’s just characteristic of propane gas.” “I had to be careful not to try to make a quick left turn with the propane gas vehicles. The pick-up wasn’t there. So I don’t do it. I just wait before I make a left turn.” Acceleration was not reported as a safety issue for RFG or M-85.

Stalling (Die Out). Sputtering and stalling were experienced in all three CNG vehicle models. Couriers, handlers, mechanics, and managers all described this as occurring at all fuel levels and with no apparent pattern. As one courier explained “...the (vehicle) died out on me when I was making a left turn in an intersection. Luckily I got it started again. Only once in an intersection, but it would die out constantly in the mornings.” During the focus group, this was an emotionally charged issue with comments such as, “If you accelerate too fast you risk a stall,” “If you put the gas all the way down it would stutter, like it’s not getting fuel; eventually it gets power again but it’s a scary feeling,” and “It stalled like 12 times on me in one day. It was very, very scary. It’s done that to me, too, going 60 miles an hour on the freeway. It just died....”

While stalling was indicated as a “safety-related problem” for 15 percent of the questionnaire respondents who worked with propane gas vehicles, the Rialto focus group and interview participants who experienced stalling or die out indicated that the trouble was with specific vehicles rather than with the fuel group of vehicles. These incidents appeared to be unrelated to a pattern of time or usage. RFG, M-85, and electric vehicle study populations did not consider this to be a safety concern.

Fuel and/or Fueling. While the safety risks attendant to the electric vehicle were perceived to be minimal, two of the six individuals interviewed commented on the charging process. Trepidation was described as “...the way that it was charged. I didn’t feel comfortable removing that. I let someone else remove it. There always seemed to be acid, or something coming from the truck...” and “I personally wasn’t frightened. I don’t think too many people were frightened. I think they had some concerns about all the power surges that occurred through the equipment. Basically, females. But nothing real alarming.” A mechanic described it as, “We have to be careful when we’re charging...collect all spills, that’s it.”

The overflow release valve caused some anxiety while fueling propane gas vehicles. A handler explained: “I know there’s a lot of pressure involved. Every time I fuel those things, I wonder if anything could go wrong. There’s so much pressure. And some of them are kind of loose; if they ever blow back

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off...but the way they go on, it doesn't seem like that can happen. I'm not real frightened, but I have thought about it."

With M-85, the possibility of fueling their own vehicles elicited negative response in the focus group session. Comments ranged from "I don't think I'd want to pump it myself" to "It can burn your hands, can't it?" and "It would take retraining, because I don't know what the dangers are. I know there are some. I know they had to wear gloves and not expose themselves too long. On that note alone, I would think it would be a little dangerous."

Participants at the Los Angeles station remarked that there was no perceived difference in fueling with RFG. While fueling was perceived to be major difficulty with CNG at Irvine station, as described in following chapters, this was predominantly an operations rather than a safety problem.

Noise. With noise, it was either a case of too much or not enough. Electric vehicles caused apprehension because they were so silent. As one courier stated, "Well, for me, it's bad because when you're driving on the street, no one knows you come, so you have to make attention. When you go to change a lane, people don't see you because you're quiet. You have to be a very good driver. Realize that you are silent."

CNG, on the other hand, caused some consternation both during refueling and while driving for all population groups at Irvine. Reaction to refueling can be epitomized as: "The first time I heard the loud noise, like a balloon getting so big it was going to explode. It's in the vehicle, like there's no more room for more fuel. I jumped the first time I heard it. Until they told me it does it all the time. Not every vehicle, but we've been told it was normal." One handler commented that "there was some trepidation on my part when I first began fueling, because they make a lot of noise. ...Lots of people are afraid of it because of that. ...I thought it was going to explode until I read the book, and it said it was normal. If I were in the market for a vehicle, and didn't know anything about it and heard a vehicle acting like that, I wouldn't go anywhere near it." An operations manager captured the drivers' sentiments by saying, "If I was driving the trucks all day long, the (model) would bother me. They are really noisy. It sounds like you have a problem all the time. The injectors are very loud. If I had to drive that truck 8 or 10 hours...I guess you get used to it." A courier elaborated with, "In the beginning, the (model) had a whining pitch to it when you stepped on the gas. It went away. But I wasn't concerned about it. I didn't smell any gas. If I had, I would have been concerned."

Noise was not reported as a safety issue with M-85, RFG, or propane gas.

Leaks. During the one-on-one sessions, propane gas couriers, handlers, and mechanics shared the strongest concern for fuel leaks. A repeated theme was to "make sure there's no leakage in any part of the system. Even by spraying it, you don't see any bubbles, but you can smell it there. Why is there a constant smell if it's not leaking? (With gasoline) you smell it if you start it up...and you can see where it's leaking. You can take care of it." *Do you have a leak detector here?* "Yes, it was requested by the office. The operations managers kept insisting. They finally gave it to us." Another viewpoint was explained as, "they would leave the little valve open. The sensor alarms never worked. We had them leaking and it never went off. They'd leave the valves loose and the fuel would come out. You'd walk by a truck and know. You just had to sniff around to find which one it was...."

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CNG leaks also caused safety concerns. One courier remarked that “if there’s a leak, you can’t tell. It just runs out quicker. So that’s a problem. Sometimes you hear it, sometimes you don’t.” Fuel leaks caused no reported safety concerns with M-85, RFG, or electric vehicles.

Public Reaction. Occasionally, fears would be reinforced by comments and questions from the general public. One courier shared that he would be asked about the placement of the muffler on the CNG vehicles and how it would respond in an accident. He confided that “I still have that fear. To me it’s a greater risk (than with a regular gas vehicle). ...The fear is getting into an accident.” And one Rialto courier countered with his own question about the size and location of the propane gas tanks: “Are we going to blow up if somebody hits us? No, but I had many people ask. I think when they introduced the vehicles to us and they explained the different testing they did with the propane gas tanks, that was proof for me. I wasn’t concerned driving it. But people would ask on the road.”

Pre- and Post-Demonstration Attitudes About Safety. The printed questionnaire specifically asked about safety concerns held prior to participating in the CleanFleet demonstration compared to current attitudes.⁵ Table 5 presents these data.

Table 5. Comparative Safety Concerns (Pre-/Post-Demonstration)

Station: <i>Fuel</i>	<i>“I had some safety concerns before the Program.”</i>					<i>“I still have some safety concerns.”</i>				
	Strong Agree	Agree	No Opinion	Disagree	Strong Disagree	Strong Agree	Agree	No Opinion	Disagree	Strong Disagree
Irvine: CNG	4-%	38%	38%	13%	8%	0%	21%	25%	42%	13%
Los Angeles: RFG	10%	0%	40%	40%	0%	0%	0%	30%	60%	0%
Rialto: propane gas	9%	33%	27%	27%	3%	6%	28%	21%	33%	9%
Santa Ana: M-85	6%	31%	44%	6%	6%	6%	13%	31%	25%	19%
AVERAGE	7%	32%	36%	19%	6%	3%	20%	25%	38%	11%

⁵ It should be noted that attitudes were not assessed prior to the CleanFleet demonstration. The “Before the Program” attitudes reported here are the participants’ recollection of their previous opinions.

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At every station, some degree of positive attitude change was significantly more common than a negative one as a result of working with the AFVs during the CleanFleet demonstration.⁶ While over half of the FedEx employees involved with CNG and RFG showed no change in their safety concerns, positive attitudinal change outstripped both negative response and the status quo for propane gas and M-85 as alternative fuels (Table 6). As previously explained, questionnaire data were not available for electric vehicles at Culver City.

Table 6. Percent Change in Safety Concerns (Pre-/Post-Demonstration)

Station: <i>Fuel</i>	No Change	Positive Change	Negative Change
Irvine: <i>CNG</i>	58%	38%	4%
Los Angeles: <i>RFG</i>	50%	40%	0%
Rialto: <i>propane gas</i>	39%	46%	12%
Santa Ana: <i>M-85</i>	38%	44%	13%
AVERAGE	49%	41%	8%

Vehicle Performance

This section concerns users' attitudes toward the *fuel-oriented performance* characteristics of the AFVs in the CleanFleet. It was important, but occasionally difficult, to differentiate between the target attributes and other engine and manufacturer influences. One model was clearly the favored vehicle across all stations and job descriptions, for a variety of reasons—several of which were pure design and appointments. While these are important because the employees perceived that these features enabled them to perform their job better, they are not at issue here. While reference to specific models may be retained in the reported comments for clarification purposes, this should in no way be construed as either endorsement or criticism.

Control vs. AFV Comparison. The perceived difference between the control vehicle and AFV from the same manufacturer was explored to attempt to eliminate model differential from the equation. It is important to note that some couriers were aware that they were driving a CleanFleet vehicle, but not necessarily whether it was an AFV or control.

Positive Characteristics of AFV. For the most part, couriers believed that “the only thing is the environment...why we’re doing it in the first place. It’s better for everyone, but I wouldn’t say that the (AFVs) performed better than a test control.” A Santa Ana operations manager pointed out: “Of course, what you’re putting out in the air, that’s always a plus. Sometimes you have to have a little bit of sacrifice to have that.”

⁶ “Positive or negative change” in attitudes was based on any shift in response. For example, a move from *No Opinion* to *Disagree* or from *Disagree* to *Strongly Disagree* would be considered a positive change in attitude.

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Mechanics and couriers at Irvine, Santa Ana, and Rialto who checked their engines regularly were impressed by the longevity of the oil and surmised that the use of alternative fuel might increase engine life as well. This was especially true with CNG and propane gas. No specific positive characteristics were reported for RFG or electric vehicles.

Negative Characteristics of AFV. All elements defined as safety issues were perceived as negative characteristics. Comparing the control vehicles with the CNGs, for example, all test vehicles were perceived to deliver less power in varying degrees. Which would the majority prefer to drive? “The control vehicles. Because of the range problem, and stalling...I don’t know that there’s anything I like more than the regular trucks. Nothing set them apart that made them better.” According to the Irvine mechanics, “We had more problems with the CNGs than the other test vehicles.” *On all three models?* “Yes.”

Several couriers and all mechanics commented on the different engines that were used to power the propane gas and control vehicles at Rialto and that any comparison would be “apples to oranges.” No specific negative characteristics were reported for RFG, M-85, or electric vehicles.

No Difference. Every fuel had its proponents. For example, a CNG courier stated that these vehicles were “the same on the road.” A handler felt that “they’re easy to drive, like a normal car.” Electric vehicles fared much the same, with “it was so similar that it took a lot less time to get used to.” In discussing maintenance features of the electric vehicle, a Culver City mechanic said: “It’s the same as other vehicles...only you don’t have to check the oil, or worry about the differential or transmission. But the rest is the same.” With RFG, a common response was “I don’t know the difference. All I know is I had a CleanFleet.” The same held true for propane gas and M-85. “I haven’t noticed any difference. The only difference is between (models). As long as it’s an alternative fuel, it’s going to be cleaner. Why not?” With M-85, “I may have a little problem trying to define.” *You weren’t conscious of the differences?* “No. A CleanFleet vehicle is a CleanFleet vehicle.”

The overall comparison between the control and alternative fuel vehicles can be summarized as follows:

	Worse Than Control Vehicle	About Same as Control Vehicle	Better Than Control Vehicle
	(%)	(%)	(%)
Irvine: CNG	38	58	4
Los Angeles: RFG	3	60	37
Rialto: propane gas	35	59	7
Santa Ana: M-85	4	76	20

Comparison of AFV Manufacturers (Same Alternative Fuel). The printed questionnaire asked those who “worked with the same alternative fuel in models of different manufacturers” which model of AFV they preferred. Santa Ana station is excepted, with M-85 represented only by Ford. Table 7 indicates the model preference for each fuel. It also identifies the weighted distribution of the perceived benefits of each model.

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Table 7. AFV Model Preference

Reason for Selection (Mark all reasons that apply)	Irvine: CNG			Los Angeles: RFG			Rialto: <i>propane gas</i>	
	Chevy	Dodge	Ford	Chevy	Dodge	Ford	Chevy	Ford
Overall Impression	2%	6%	38%	10%	10%	40%	9%	39%
Mechanical Operation		8%	25%			10%		30%
Ease of Refueling	2%		6%					9%
Manufacturer Support		2%	13%					15%
Vehicle Maintenance			10%				3%	12%
Vehicle Reliability		4%	38%				3%	27%
Level of Technology		2%	17%					24%
Other: Better Mileage		2%	2%					
Other: Power/Accel	2%	4%	2%		10%		3%	
Other: Non-fuel		2%	21%			20%		15%

Performance Characteristics. Focus group and personal interviews provided the venue to develop in-depth discussions regarding employees' attitudes and perceptions of AFV performance in this service. As discussed above, it became clear during the one-on-one sessions that there is often no clear-cut distinction between performance and safety issues.

Overall Performance. The consensus was that all the CNG vehicles seem to have less power than the control vehicles on regular gasoline. Among the three CNG models, Dodges reportedly had the best pick up and Ford came the closest in acceptable performance to a "normal" vehicle, performing as well as a "low-powered gasoline vehicle." No other overall performance problems (handling, steering, braking) appeared to be affected by the alternative fuel system in any of the vehicles. According to both operations managers interviewed at Irvine, the CNG vehicles did not receive rave reviews but they could not relate any performance issues specifically to the CNG program. In one mechanic's opinion, the Chevrolet vehicles had many "driveability" problems because they were delivered from the factory as gasoline vehicles and converted by a local vendor. An operations manager voiced his concern as, "I find they don't run as well as the regular fuel vehicles. They stutter. I'm really not in favor of them. I understand the need, considering the amount of miles that we drive as a whole station, but I really don't think they are as efficient and dependable as regular fuel vehicles. We're incurring a lot of costs because of that. Refueling these things, the compressor... I'm just not in favor of the CNG program."

There appeared to be no appreciable handling differences between the propane gas and control vehicles other than acceleration from a dead stop. According to the majority of the couriers, acceleration was markedly less than the control vehicles in both Chevrolet and Ford models.

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The consensus of opinion was that, other than driving range, acceleration, and top speed, as discussed below, the electric vehicles presented no overall performance problems. It was perceived by the primary driver as “fun to drive” and that “you just had to get used to it.” The braking was more sensitive than a regular van, the steering “didn’t involve a lot of muscle or body English” and it was “very easy to drive.” An operations manager shared his concern about a lack of power and that even though it “drives like a normal car,” he remarked that “it may not have conked out on me, but that’s what I was afraid was going to happen.”

Overall performance characteristics were virtual non-issues with both RFG vehicles at the dual station in Los Angeles and M-85 at Santa Ana. Perceived differences in RFG acceleration, power, and smoothness appear to be model, not fuel, attributes. M-85, on the other hand, met with mixed reviews regarding acceleration but performed without fault for most users.

Start-Up. The CNG vehicles, particularly the Chevrolets, seemed to have a cold driveability problem. When cold, they didn’t idle or run well. They reportedly stalled and sputtered. Couriers acknowledged that they did not take the time to warm up their trucks. One courier expressed the opinion: “I never had a problem after the initial start-up. But it was very aggravating.”

Propane gas vehicles, as well, occasionally would take “a long time to start.” Here, bad diaphragms in the regulators were “constantly being replaced and changed and lock offs would be faulty on the system.” As one operations manager succinctly said, “They all take more cranking in the morning to start them than gasoline. Gasoline starts faster, stalls less.” Another courier did not consider this a problem: “It takes a few cranks, more than regular gasoline. But it’s not that bad. It’s nothing to worry about.” While two couriers claimed to have no problems at all with starting their propane gas vehicles once they learned the “trick” of waiting until it “clicked on,” the majority opinion was defined as, “The ignition is a little harder to get going (in the Chevy).” *To start, or just the ignition switch?* “To start. You have to give it good fuel for it to start. With the Fords, you just turn the ignition and off you go.” *When it’s cold in the morning or while you are on the route?* “All the time. Chevy propane gas. I also had a little difficulty with the Chevy control.”

With RFG, “the Chevy started up real quick. The Ford had to turn over a couple of times.” *Warm up?* “No real hesitation, you just start them up and go.” M-85, as well, created no start-up problems and “once it was warmed up, you could stop and start without any hassles.” The electric vehicles were reported to have no start-up problems at all.

Stalling (Die Out). Again, CNG vehicles were regularly cited as having stalling problems, especially in the mornings. Chevrolet vehicles, with IMPCO’s advanced fuel electronic (AFE) fuel system, bore the brunt of this criticism. One courier voiced the general opinion: “It doesn’t make any difference if you let the Chevy warm up. It happens in the middle of the day. And it’s out of the blue. You don’t have any warning.” *Does it just die?* “It will be like it’s choking. Like it’s starving for fuel, or air.” Another’s frustration was evident with, “You could start it, go two feet, and it would die on you. I only drove one or two, but from hearsay, they all had the same problem.” Dodge and Ford CNG models proved more reliable in this regard, but several couriers experienced stalling when backing up with the Ford vehicles.

Electric vehicles were accused of “having a mind of their own when it wants to go.” When queried about stalling situations, the Culver City courier reported: “It hasn’t happened yet. I’ve had some problems, though. I’ve gone to a couple of stops on a busy intersection and have come back, started it up. And when I

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put it in reverse it hasn't moved a couple of times. It started backing up, but then when I put it back in drive, it just died. It was on, but it didn't move. I kept trying, and finally it did go. That's only one time, and it only happened one day. That's basically the only trouble I had. It's never died on me on the road."

Evidently, the stalling problem was corrected in the propane gas vehicles, and was described by one courier as, "They used to stall all the time. They don't stall any more. But they used to when they first started the program. All the valving was the problem. The diaphragms and stuff that controls the temperature of the propane gas. So they fixed them all."

No stalling problems were reported by the RFG or M-85 users.

Reliability/Dependability. Mechanics and drivers of CNG vehicles believed that reliability in terms of problems with the drive train and in the fuel system would need to be improved before these AFVs are released to the general public. A CNG courier shared a possible solution as, "The mechanic showed me what I could do to make the Chevy not die out so much; there was like a little computer chip he told me to disconnect, wait a few seconds and plug it back in. He said it had a memory that would 'pick up bad habits.' ...that's the way he explained it to me...seemed to help. Just in the Chevy." In the words of an operations manager at Irvine: "What we need is reliability, vehicles that give accurate readings. The whole thing boils down to the fueling process. I have driven a lot of the CNGs and they sputter, power cuts in and out, stalls. They just don't seem to be as reliable as the regular fuel vehicles. I understand the need to go to alternate fuel, but our business is based on customer satisfaction, and if a vehicle cuts out, it impacts our ability to service the customer and that's what we're finding."

Propane gas experience was similar, if less dramatic. A Rialto operations manager summarized the situation as, "minor problems in the beginning as far as cutting out, not staying running. I wouldn't say they (propane gas vehicles in general) are 100% reliable. They still have bugs. Theoretically, the propane gas is a good system on the Fords, not the Chevys. We're still having problems with them. If they get the bugs out so they last longer and get better distance, better mileage, I think it would be a good system with the Fords. I think it could work." Several couriers cited overheating with the propane gas Chevrolets.

When asked to compare the reliability of different types of batteries in the electric vehicles (NiCd vs. lead-acid), a mechanic at Culver City reported that they were both the same, and neither presented a problem. An electric vehicle driver described his routine as, "When I come in around 10:00, I shut it down, unplug it, then take it out for a test ride to be on the safe side every day. Around the block. It's better than going out there and having it die out there." A second electric vehicle courier shared that "it was pretty reliable if you do all you're supposed to do afterwards, like plugging it in, unplugging it, checking the voltage, and all that sort of stuff. It only broke down on me once. There were several warning signs. It kind of slowed down gradually." Since Culver City did not have the same vehicles throughout the CleanFleet demonstration, an operations manager summarized the situation as, "This particular model, no. The old ones [lead-acid], there were a couple of instances where they broke down. I was a courier when this first started. My initial concern was running out of power. I can always fill up with gasoline. Can I make it back home? Since they brought this new one [NiCd], I don't think we've had that problem. It drives real well. It's heavy, but no problem."

Both RFG and M-85 fared well in the dependability arena, with one exception in each fuel. With RFG, "The only problem with the Ford is the ignition switch. You have to put the key in a certain way. But it never stalled or anything like that." Early fuel delivery problems with M-85 were described as, "There was

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one instance, right after they implemented the program, on [the freeway], it lost power, like it was almost out of gas. But I had a full tank. I was able to get to the side and the engine was dead. I could get the engine fired back up and got going again, lost power again. It was something with the delivery system and the lines. I know they had to change something. Once they found it, they fixed them all.’⁷

Driving Range. Range limitation and/or lower fuel economy was a dominant issue with CNG, M-85, propane gas, and electric vehicles. Fueling difficulties with these AFVs may have contributed to or merely compounded an existing problem.

Specifically, with CNG, “I don’t know if [Dodge] had a smaller fuel tank, but I couldn’t figure out why they couldn’t get as many miles with the Dodge as the Ford and Chevy.”⁸ Chevrolet was lauded as having the most range. Basically, couriers with limited mileage routes did not have as much of a problem but, even then, “I worry if I run out, there aren’t any [CNG] stations in my area.” With the CNG vehicles, “I’m barely making it back with gas. The [natural] gas is great. It runs smooth, I never have any problems, it’s never broken down on me. But I have to come back to the station and fill up if I know that I’m going to run out. Last week I had to come back to the station in the middle of my route, because they said something had been wrong the night before, they didn’t fill it enough.”

In the CNG focus group, every one of the six participants had run out of fuel at least once. One operations manager lamented that “basically, the estimate I got was that the range should be 130 miles. There’s not a route in the station that maxes out at 130 miles. Yet we still have vehicles running out of fuel.” He added that “some of it is driver error. Not all the time, maybe 1 out of 5 times the driver did not look at the gauge properly. That’s why I think some of the vehicles might be leaking. I’ve asked the mechanics, but they haven’t come up with anything. It seems to be somewhat different each time. You have to take into consideration what the vehicle is doing throughout the day. A lot of stopping and starting. Short drives in between. Maybe there’s a buildup that could be causing the problems. I don’t know if that contributes. I only see the end result, where we have to push some of them up to be refueled. Some are barely making it back to the station.”⁹

All three operations managers at Culver City commented on the electric vehicles’ limited range of about 50 miles, “as well as a limited ability on certain streets that have inordinate bumps, sidewalks, and pulling into driveways that might have high steep inclines, because of the battery cage underneath. From my perception, they are limited to the straight and level. Those are the limitations. And, in a pulling and climbing environment, the 50-mile range will probably be diminished.”

⁷ Note: The M-85 fuel had become contaminated with hose material because of a materials-compatibility problem on the fuel dispenser.

⁸ Note: During the demonstration, Southern California Gas added an extra tank with concurrence from Chrysler.

⁹ Note: During most of the 24-month demonstration, the fuel supply system could not completely fill a portion of the 21 vans to be filled in succession during the nightly refueling process. The problem noted above was compounded by this situation.

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In general, no difference was detected with the RFG vehicles. However, one courier stated, “To me, it saves a lot of gas. You can go on a tank of gas for a long time, about a week and a half. I do a lot of driving on my route. And the RFG saves a lot of gas compared to the regular trucks.”

Five of the seven propane gas couriers in the focus group (71.4 percent) ran out of fuel on their routes. One courier complained that “I ran out of fuel twice. And my route takes 3/4 of a tank.” As one mechanic tersely said, “You can’t go very far on propane gas.”

With M-85, “I didn’t notice any difference because it’s not equivalent. I wouldn’t know how to measure. Plus I only drive about 10 miles” and “I had heard that the gas mileage wasn’t very good on the methanols.” This was corroborated by an operations manager who stated: “The miles per gallon were very low. An unleaded vehicle could get almost 5 miles more per gallon. That was the consensus. We kept them pretty well fueled. But you couldn’t tell if it was full or not.”

Fuel Gauge. At both the propane gas and CNG stations, the lack of driving range was complicated by the perceived inaccuracy of the fuel gauging systems. Unreliability of the M-85 fuel gauges was also noted in the early phases of the demonstration.

With CNG, a problem was the location of the gauges on the trucks, exemplified by: “At first I had a hard time finding out where they were. They had to tell us where to locate them. They’re different on each of the vehicles [vehicle models]. They really weren’t set up in an easy way to work in them” and “I’d like to see the gas gauge more visible.” Another courier shared that the gauges would “jump around, back and forth, and you didn’t know what you had. A lot of couriers were told to watch their mileage. Still is one of the problems. They gave us a replacement unit just lately, after all this time. Even that doesn’t read all the way full. On both, but mainly the Ford.”

Reaction to the propane gas gauges was epitomized by: “The only thing I thought was negative was that you could never tell how much propane gas you have. The gas gauges are not accurate. ...they can’t register the correct amount of propane gas, so it never registers full. I have one truck that only registers 3/4s. After 30 miles, it goes to completely empty. So you never know. I guess you could crawl under the truck. But that’s a real inconvenience. I guess there’s a level on the propane gas tank and you can check the level still in the tank. But the instrument is not reading that correctly.” One courier commented: “On the Chevys, the fuel gauge is pretty erratic. It can show empty when you start, then works up to full. The Ford is not confusing.” Another courier explained: “Because the dashboard gauge wasn’t accurate you really didn’t know how much fuel was in the tank. Every truck was different but none of them worked. There were vast differences from Ford to Ford and with the Chevys also.”

Most couriers trusted the M-85 fuel gauges, but, as one courier shared, “They ran out of gas. I heard it on the radio, in the morning. The gauges say there’s gas in it.” From another courier’s viewpoint, “I had some problems, and that was the fuel gauges weren’t working on some of the trucks, but I don’t know if that was related. But they were supposed to fix all of them. I think it was a malfunction of the gauge. The gauge and the fuel pump.” A mechanic believed it to be directly fuel-related, saying, “we had problems with all the fuel gauges in the vehicles. I understand that that was directly related to the methanol. We had no problem with the control vehicles. It would read full and be completely empty. It would read 1/2 and be completely full. Very inconsistent. We had a number of vehicles run out of fuel even though we fueled it every day. We

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knew they had to be fueled every night. The problem was that, as we fueled, the gas tank would shut off, reading that it was full. But it wasn't. The tank would say it was, though."

There was no perceived difference in the fuel gauge system with the RFG vehicles. While "running out of power" was described as a concern with the electric vehicles at Culver City, none of the interviewees attributed this to a malfunction or problem with the fuel (or charge) indicator.

Pre- and Post-Demonstration Attitudes About Vehicle Performance. The printed questionnaire specifically addressed vehicle performance concerns held prior to participating in the CleanFleet demonstration compared to current attitudes.¹⁰ Table 8 presents this comparison.

Table 8. Comparative Performance Concerns (Pre-/Post-Demonstration)

Station: <i>Fuel</i>	<i>"I had some performance concerns before the Program."</i>					<i>"I still have some performance concerns."</i>				
	Strong Agree	Agree	No Opinion	Disagree	Strong Disagree	Strong Agree	Agree	No Opinion	Disagree	Strong Disagree
Irvine: CNG	15%	56%	25%	4%	0%	10%	54%	13%	19%	4%
Los Angeles: RFG	0%	30%	40%	20%	0%	0%	10%	20%	50%	10%
Rialto: propane gas	15%	36%	18%	24%	6%	15%	27%	21%	33%	3%
Santa Ana: M-85	19%	38%	19%	6%	19%	0%	19%	19%	31%	31%
AVERAGE	14%	45%	23%	12%	5%	9%	36%	17%	28%	8%

Similar to the average response in attitude shifts regarding safety concerns, a positive attitude change was significantly more prevalent than negative after working with the AFVs. The percentage of change in attitudes for Rialto and Santa Ana (propane gas and M-85) was identical to the attitude shifts regarding the safety. At Los Angeles, 10 percent of the RFG users' opinion changed positively, with 50 percent of those responding indicating that their performance concerns were less than before the CleanFleet program. The ratio of increase in performance concerns vs. safety concerns was greater for CNG, however, with only 4.2 percent showing a negative change regarding safety and 22.9 percent for vehicle performance.

¹⁰ Again, please note that attitudes were not assessed at the beginning of the demonstration. The "Before the Program" attitudes reported here are the participants' recollection of their previous opinions.

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Table 9. Percent Change in Performance Concerns (Pre-/Post-Demonstration)

Station: <i>Fuel</i>	No Change	Positive Change	Negative Change
Irvine: <i>CNG</i>	44%	33%	23%
Los Angeles: <i>RFG</i>	40%	50%	0%
Rialto: <i>propane gas</i>	39%	46%	12%
Santa Ana: <i>M-85</i>	38%	42%	13%
AVERAGE	49%	41%	8%

Technology Improvement Suggestions. When asked during the focus groups and interviews if they had any technology improvement suggestions, most respondents across all five fuel groups simply reiterated a perceived problem, with no concrete “fixes” offered. One person added a little levity with “I don’t know how much they can improve it. It needs more power. Put the 3 of them together to get one good vehicle.” The mechanic for the propane gas vans was more specific regarding engine compartment design: “I think they should re-think the installation on the system because the way they installed the propane gas [hardware], it interfered with some of our other inspection areas. We couldn’t get to an item easily. They have everything up front. There’s no room, you can’t get at anything. To work on anything underneath, you have to pull everything out. The regulators are right there in the way. You can barely get to the dipstick. If you put your hand in there, you cut yourself.”

A CNG handler suggested that “the middle tank is easier to hook up to than the back one. You don’t have to yank the hoses, it goes on easier.” A propane gas handler also offered that “I’d like to have the connectors come directly straight out; they come out in different angles, some are higher, some are lower. It’s not that big of a deal, but (it would be better) if they all came out the same direction.”

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Station Operations

The following discussion analyzes opinions related to station operations issues that emerged during the CleanFleet demonstration. These were business and personnel issues. Most pertained to all stations, although a subject is included here only when the questionnaire, interviews, or focus groups produced substantive information. Unless otherwise noted, quotations are representative of the majority opinion.

In all areas except “out-of-service time” when test vehicles were undergoing emissions testing or other maintenance service, the use of RFG at Los Angeles created negligible, if any, effect on station operations when compared to the control vehicles. Consequently, the following discussion only addresses CNG, electric, propane gas, and M-85 vehicles which affected operations in varying degrees, and for a variety of reasons. It is interesting to note that, on balance, the couriers were unaware of any significant internal impact on operations from the CleanFleet demonstration nor did they think that the program should have been handled differently.

Fueling

The fueling issue was considered by most personnel to be perhaps the single most important operations issue at Irvine. All segments of the study population reported that the fueling compressor did not maintain enough pressure to completely fill many of the vehicle tanks during the evening refueling process. This may have contributed to the CNG vehicles running out of fuel en route.

At Culver City, the courier had the responsibility to “plug in” the electric vehicles at the end of each day. This was reportedly an “easy” procedure because the system was not very intricate or technical. From the operations manager’s point of view, “As long as it’s charged every night we have no problem. The vehicle sits from, say, 6:00 p.m. to 7:00 a.m. the next morning. So that’s plenty of time overnight. They only charge at night. With the G-Vans [lead-acid], they had to come back in every now and then and plug them up. This one [NiCd in a G-Van] holds a much longer charge, but also takes longer to charge.” Other than this observation, the operations manager was unaware of other differences between the electric vehicles, including whether the batteries were NiCd or lead-acid.

Fueling at Santa Ana with M-85 was deemed to be “just like regular” by the couriers, but presented time constraints and equipment reliability problems for the operations managers and handlers. Operationally, propane gas usage dictated that the station “had to do a lot of rearranging of our fleet on a weekly basis to accommodate the propane gas [vehicles]. [We] had to be selective about the routes for the propane gas [vehicles].” A second operations manager shared that “from my observation, there was minimal if any impact that wasn’t on a normal daily basis...[but] they’re not good to use as a spare.”

Time. The time it took to fuel the AFVs was a consideration for both CNG and electric vehicles at their respective stations.

An Irvine operations manager explained the situation in the following way: “We have 21 CNG vehicles vs. 100 or so regular fuel vehicles; at night the fueling of the CNG takes maybe 40 minutes longer than that amount of regular vehicles. The compressors seem to not have enough pressure. You may start out fueling 7 or 8 of the vehicles, all of a sudden the most pressure the pump will put out is 2,400 pounds. The

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pump just won't do more. Sometimes we're pumping into the CNG vehicles as long as 10-15 minutes per vehicle; the pump just won't put out any more. We might have 1/2 hour dead time while the pump builds up pressure, but that still doesn't seem to do any good. It adds another 4 hours a night on the operation just for the CNGs. Even then, once the compressor stops putting out the amount of pressure we need, it doesn't seem to matter how long we wait, it'll only come to 2,400-2,500 pounds. ...The fueling of these vehicles is a major headache. It really is."

Handlers (refuelers) concur. "The problem is the pumps don't give you enough fuel for all the cars [vans]. You're basically getting 2,000-2,400 lbs CNG, when you need 3,000 minimum. There's nothing I can do; I can't make the pump put more gas in. There are always trucks being towed in because they ran out of fuel." When describing the fueling process, another handler explained: "I hit the generator button and it builds the pressure; it will hit 3,000-3,200 for the first 5 cars; then they say you have to wait 20 to 30 minutes to get the full pressure back, so it has to rebuild itself up. But it's killing us time-wise. It takes approximately 5-7 minutes per vehicle, and then it just shuts itself off. Once the pressure gauge on the pump hits 2,400, the machine won't go past 2,400. It just shuts off until it builds back up, and that can take anywhere from 1/2 hour to an hour. You can fill 5-6 [vehicles] before it runs down. We have to keep going. So there's not enough fuel in each of the vehicles. We put a sticker on that says you need more fuel, but the couriers just go. Sometimes we can get up to 7-8, depending on how fast we can get the vehicles out of the building to the pump. From 12 to 20, you're lucky if you get 2,600 [psi]."

For the electric vehicle at Culver City at the end of the demonstration period [NiCd battery], the courier reported: "The only problem I have with that is that it takes 4 hours before it even starts charging. [I was told] that the battery has to cool down before it charges back up. But it doesn't matter whether it's cold or not. Whenever I turn on the switch, I have to wait 4 hours. It has a 4-hour digital clock on top and, after the 4 hours, it starts to charge." *How long is the total time?* "I can't tell you. It charges all night. There are times, during lunch, I'd like to be able to just plug it in. But it doesn't work that way." Another courier was told the waiting time was only an hour. [Note: This could have been an earlier G-Van model with lead-acid batteries.] The actual "plug in" process took only about five minutes.

With propane gas, "it takes a little longer to fuel the propane gas [vehicles] than the gas [gasoline], by a couple of minutes per vehicle. We use a standard of about 8 minutes per vehicle for propane gas vs. 6 minutes per vehicle [for gasoline]." This added time was not considered significant, and was explained as "we were able to save more time by improving the efficiency of the people fueling, more than what was cost by the extra process. [After the learning curve,] I had people out there who could fuel propane gas vans as quickly when they wanted to." Another operations manager added: "I don't think it takes all that much longer to fuel one of the propane gas [vehicles]. But you do have to fuel them more often, it seems, because they only have a 160-mile range. They're fueling those all the time."

M-85 brought criticism from the operations managers, as well, that "it took too long to fuel the vehicle." Although the fueling process was basically the same, one M-85 handler added that "I know they get less gas mileage, so if anything, they might have to be fueled more often. We fuel them every night just to be sure."

Equipment. Any change in fueling equipment for propane gas and RFG was transparent to station operations. As described above, the inability of the natural gas compressor to maintain pressure with use and

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over time and fill all the vehicles to capacity created a problem for Irvine's operations. Another operations manager reiterated the same sentiment about CNG with "the compressor runs out of steam as the fueling process goes on. With the number of vehicles we're trying to fuel, we get down to the last 6 or 8 and it just takes forever to try to get the pressure up, and it will never come up to full pressure. So we end up having to leave those vehicles under-fueled. Otherwise, we'd be there all night. The compressor just won't build up enough pressure unless we let it sit for an hour, which we can't afford to do. We have people on the clock. That has been a real problem for us. I think it relates to the compressor not being designed to suit the amount of use over the period of time it's being used." A mechanic summarized by saying, "If the whole fleet were CNG, you'd have to have a hell of a lot bigger fueling station."

Durability also came into question. As related by an operations manager, "I don't think the [CNG] equipment is durable enough for the program. If this was a pump that was installed on the street in a station, they'd have some serious problems. We use it basically once a night for 20 some vehicles. And we have problems with the equipment. The nozzle coming off, breaking. Granted the people aren't treating it with kid gloves, but it's normal use. And we have had a lot of problems with it breaking on us. Ten times the problems of regular gasoline." A mechanic added: "We had a couple leaks (on 2 occasions); ...it seems like every week or so the guy is here from the gas company." In brief, a handler quipped: "It does break a lot."

While not a consistent or particularly serious problem, the courier at Culver City relayed the information that the (electric) "charger, sometimes it gets gremlins. Sometimes you have to turn off the main power and then turn it back on, then turn the vehicle on. I did that a couple of times and it just didn't go. I ended up just leaving it there. The next day, I came back, turned it on and it turned on."

One propane gas equipment setup recommendation came from a Rialto operations manager who offered that "I think I would have an upright tank as opposed to a flat one. It would save space and they could possibly be mounted near the gasoline fueling operation. I don't know if that's possible from a safety standpoint. That would make it easier; we had to integrate the parking plan to compensate for the fact they were being done on two separate ends of the operation."

At the Santa Ana station, operations managers and handlers unanimously agreed about a durability problem with the filters for the M-85 pumps. In one operations manager's words, "We would go through the filters real quick. Several times we ran out of fuel, and there was still fuel in the [storage] tank. Because of the buildup almost to sludge, you couldn't get any of the fuel out. We would change a filter, and after about a week, we'd slow down, very, very slow. Then when we went to get more fuel, it would say that we still had 300-400 gallons in it, and the pump would completely shut off. It would not allow us to pump anything else out."

M-85 handlers also remarked about the gas caps, which are hooked to the nozzle, saying that "a lot of times the fuel would drip on the gas cap and I'd get it on [my hands] when I screwed it back on." This caused no skin burns, rashes, or irritation, though, and this handler would wear gloves to gas regular vehicles as well. One handler detailed a difficulty in fueling two specific vehicles because "the gas tanks were messed up. The tube that went down to the gas tank was designed wrong...it always clicked off. You had to turn the thing sideways and hold it."

Ease. The ease and/or simplicity of the fueling process was a non-issue for all fuels, with minor exceptions with CNG and propane gas. Other than occasionally getting "stuck," the CNG fueling process

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was perceived to be easy to handle for both men and women. One handler designated the system as “user friendly”; however, a mechanic hypothesized that “I think for the general public they’ll have to come up with something a little simpler. I know even the guys out here have a problem with the nozzle. They’ll have to come up with something like a conventional nozzle.” Another handler corroborated: “You have to put it on a certain way; takes a week or so to figure out how to put it on and how far you can go” and that it needs to be more “user-friendly. You couldn’t just walk up and do it if you didn’t know how. You’d be there all day.”

The ease of refueling with propane gas met with mixed response. One courier offered the suggestion that “if the gauge read more accurately, you wouldn’t have the problem” while another commented that “it could be simplified and made more like [gasoline]. But it wasn’t that much more complicated.” Yet another courier felt that “it’s just as easy as gasoline fueling, maybe easier since you’re locking the nozzle on to the fuel spout. You don’t have to hold it...it just screws on.” A handler offered his opinion that “propane gas takes a little longer and is a little harder, but I’d rather do that. All in all, it’s a cleaner fuel than regular gasoline. I get gas [gasoline] all over me.”

Personnel Issues

Personnel issues included productivity, morale, communications, and training. These issues were addressed in several ways for cross reference. An overview of the quantitative results regarding the effect of CleanFleet on “Overall Productivity,” “Job Satisfaction,” and “Meeting Schedule” is shown in Table 10.

Table 10. Attitude Impact

“How did working with AFVs and the CleanFleet experience at your station affect your work?”

Station: <i>Fuel</i>	No Change			Positive Change			Negative Change		
	Overall Productivity	Job Satisfaction	Meet Schedule	Overall Productivity	Job Satisfaction	Meet Schedule	Overall Productivity	Job Satisfaction	Meet Schedule
Irvine: CNG	65%	77%	63%	6%	13%	6%	27%	8%	29%
Los Angeles: RFG	60%	60%	80%	30%	30%	10%	0%	0%	0%
Rialto: propane gas	52%	45%	55%	13%	19%	13%	26%	19%	13%
Santa Ana: M-85	56%	38%	56%	25%	44%	19%	13%	6%	6%
AVERAGE	58%	59%	50%	13%	21%	10%	22%	10%	18%

Productivity. As shown in Table 10, an average 22 percent of all respondents at the four sites who completed the questionnaire indicated a “negative change” in their overall productivity due to working with the CleanFleet. A second question also addressed the productivity issue in the quantitative printed

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questionnaire. In this, on average, 17 percent of the total respondent population indicated that the demonstration affected their productivity in some way, as illustrated in Table 11.

Table 11. Productivity Assessment

“During the CleanFleet Program, I was able to meet my regular schedule without interruption.”

Station: <i>Fuel</i>	Strong Agree	Agree	No Opinion	Disagree	Strong Disagree
Irvine: CNG	17%	40%	23%	15%	6%
Los Angeles: RFG	40%	30%	10%	10%	0%
Rialto: propane gas	23%	45%	10%	27%	0%
Santa Ana: M-85	50%	44%	6%	0%	0%
AVERAGE	25%	40%	15%	14%	3%

One operations manager summed up the general belief across all stations when he commented that productivity was affected negatively “on a limited basis, based on vehicle performance,” but added the caveat that “a mind set is hard to calculate. I know I haven’t heard anyone say anything really positive about their (AFVs). It was something they didn’t have a choice in.”

Other than vehicle design and non-fuel-related issues, the couriers cited “running out of fuel” as the main reason the AFVs interfered with their productivity. Among those who had run out of fuel with their vehicles, the consensus was that one solution would be for them to be trained to fuel the vehicle themselves, instead of waiting for a handler or manager to do it for them.

Additional record keeping due to the CleanFleet demonstration was perceived as a minimal interruption.

Morale. In all discussions about the effect of the CleanFleet program on employee morale, operations managers noted a negative influence while couriers discounted the effect. In fact, a pervasive feeling throughout all couriers was expressed as, “I was happy, because we got new vehicles. ...A nice change. Everybody was happy.”

Operations managers at the Irvine station noticed a difference in morale with the FedEx employees working with CNG, described in the following way: “I think they just didn’t have a choice. They just have to go with the program. They’re not real happy about it. But they’re not constantly complaining other than when their vehicle sputters, cuts in and out when they’re driving.” This sentiment was softened by another manager who stated: “It was presented to us as being sponsored by the Gas Company. It wasn’t really costing us as a company, which is nice. We got these nice new vehicles, which is always welcome. Plus I think, both as a company and individually, the employees are very sympathetic towards environmental issues. All of us who live in Southern California have air quality in mind. Of course, they were a little leery of the

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operation of the vehicle itself, if it was going to perform differently...but very little resistance.” The consensus was summed up by “it’s over now. And we’re glad.”

At Culver City, an operations manager believed that, “for the most part, couriers didn’t want to take [the electric vehicle] out. It was used as a last resort. Because they may not make it through the day on a route. Like I said, it was a frequent occurrence that it had to be towed in. This was a while ago, because we haven’t had them for a while [lead-acid battery vans]. They took them away, because really they sat. They weren’t going anywhere. I don’t know if they were leaking or what. Just recently, I’ve seen one back [NiCd van]. I can’t differentiate which one.” However, the couriers who drove the electric vans countered that “it was mine. Coming in later, sometimes I have to go look for a van. But this one was assigned to me,” and “It took some time to get used to, but not very much. From an environmental point of view, it’s a great truck. And from a use point of view, it’s a great truck. I’m sure the technology will get better.”

Again, at Rialto, operations managers reported: “I had couriers that almost refused to drive the propane gas [one model].” *Any change in morale?* “Yeah, the people who got the [one model]. With the [another model], there was absolutely no difference [between propane gas vans and gasoline control vans].” Another operations manager supported this thought with, “the only issue was which model the couriers were going to drive.” Again, couriers in the one-on-one sessions disagreed in principle, saying that the only difference in their productivity was when they ran out of fuel.

M-85 couriers denied that driving the vehicles affected their morale, but operations managers observed that “some people wouldn’t touch it. They saw two vehicles catch on fire. Even if it wasn’t methanol related, unfortunately methanol intimidated a lot of people.”

Costs/Customer Service Interruption or Adjustment

While the impact of the CleanFleet demonstration appears to have been transparent to the customer, FedEx managers feel “very much exposed.” The basic source of interruption at the CNG station was when the drivers had to come back to the building to refuel or get another vehicle. According to one operations manager, “Two to three times a week we are towing in a vehicle that ran out of gas. So we are incurring a lot of towing charges. It has added more hours to the operation and cut back on the reliability of the fleet.” Another elaborated that “when a vehicle is stranded, it impacts the customer. There could be a 30-40 minute delay in getting another vehicle out there, then tow it in. ...driving a test vehicle is no excuse for not making a delivery on time. We’ve covered, but the impact would then roll over to another part of the operation. If a route returns to the building late, that’s very important. There aren’t enough CNG vehicles now to put a serious dent in the operation, but we have had occasions when they got in at 1820 or 1825 because of problems. Not every day, but it has happened.”

Operations managers in charge of the electric vehicles at Culver City had various reactions on the subject. According to one, “I had some concerns about it. My main concern was that the consumption output has been very heavy,” while another thought “the impact [effect] hasn’t really varied. It’s been pretty reliable.” When queried about the advisability of an on-board charger, the unilateral response was, “I could see some advantages, but my first concern would be cargo space. If it would cut down the amount of packages I can carry, no.”

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Rialto operations managers identified that the propane gas vehicles “incurred costs when they broke down or ran out of fuel. One or two a month would just mysteriously die and they were out of fuel.” It was also mentioned that “there was an operational problem when we had to do some fast swaps, because not everybody was trained on propane gas. In theory, if we had a whole fleet, everybody would be trained in them.”

Higher fuel costs was cited as an issue for M-85 operations managers. Santa Ana was the only station to recognize data collection as an operations issue, commenting that “we have too many employees, and finally I assigned one person to fuel all the time. He’s got to have a day off sometime, so everyone has to be trained on it. With the three unleaded [control vehicles] we had problems because people switched work groups, so it was a continuation of training. I don’t know what you could have done differently.”

Although no operations managers were available to be interviewed at Los Angeles, interviews with other personnel indicated that RFG made little or no impact on station operations.

Vehicle Service and Maintenance

Service and maintenance for the AFVs in all fuel groups of the CleanFleet essentially was the responsibility of the vehicle manufacturers, their dealers, or the vendors of alternative fuel systems. Opinions on service were widely divergent, based on model. Inconsistent responsiveness and that “they didn’t let us do anything” caused concern with the mechanics and may have colored their perception of the vehicles per se.

Couriers hypothesized that the CNG vehicles were probably maintained better because they were used every day on line and usually driven by the same person. However, the couriers were “aware” that, when an AFV went out of service, it was “gone for months.” Mechanics at Irvine agreed that the turnaround “could be anywhere from one or two days to two months, a couple took six weeks.” With RFG as well, the couriers’ one complaint was that “when they took them out to service them for regular maintenance, they were gone forever. We’d wait two weeks to get those trucks back. That was my main gripe. You’d have your truck all full, and then two weeks before you’d see it again. It’s just an inconvenience...” and “The only negative thing that I had was that they had to take them off-line [for emissions testing]. It seemed like all of the time they were taking them off-line.”

A Rialto courier captured the general reaction with “the other thing is not pulling them off the line so much. It seems like when they go off for testing they’re gone for weeks. It’s gone and 3 weeks later your stuff comes back. We knew they [the propane gas vans] were going to be tested, but I don’t think any of us realized it was going to be so often and so long.” One mechanic at Rialto explained that “the most they were down was maybe a week. Sometimes it would take a while before they responded. They kept moving their vendors around,” but another mechanic agreed with the couriers’ perception by saying, “they would take trucks and keep them forever. We didn’t have enough trucks for them to do that...It just took too long for them to work on them.”

At Culver City, a mechanic complimented both the electric vehicle and the maintenance support he received by saying, “they are reliable. I don’t have a problem. It’s more than a year and a half, we have them. No problems. ...Let me tell you, that in a year and a half, I didn’t even change the brakes. Everything’s fine.” When specifically asked to compare the two battery types used in the electric vehicles, one

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mechanic offered that “well, the NiCd is much better than the acid battery.” *Better from what standpoint?* “Water. With the NiCd, it’s only once or twice a month; the other you have to put in water every week. It’s much different.” *So servicing it was more frequent with the lead acid than it was with the NiCd?* “Exactly. I did the acid ones, and [Southern California] Edison did the NiCds.”

Training

At the beginning of the CleanFleet project, employees were given a brief safety orientation, then kept informed through posters and newsletters about the progress of the project, e.g., miles driven, fuel consumed. Otherwise, they were not given advance information about results. The subject of training was approached in the one-on-one sessions as well as in the printed questionnaire. On average, questionnaire data shows that over 75 percent of the respondents felt that they received the information/training they needed to work effectively with the AFVs. As shown in Table 12, only in some of the CNG (17 percent) and propane gas (12 percent) populations was the training perceived to be inadequate.

Table 12. Training Assessment

“I was given all the information/training I needed to work effectively with the AFVs.”

Station: Fuel	Strong Agree	Agree	No Opinion	Disagree	Strong Disagree
Irvine: CNG	13%	63%	8%	13%	4%
Los Angeles: RFG	20%	30%	40%	0%	0%
Rialto: propane gas	27%	49%	9%	9%	3%
Santa Ana: M-85	50%	44%	6%	0%	0%
AVERAGE	23%	52%	11%	8%	3%

During the personal interviews and focus groups, however, the picture was not so clearly defined. This was especially true with CNG. Approximately 60 percent of the couriers interviewed did not think there was enough training to be comfortable with the CNG vehicles. One courier summarized this group’s thoughts that “it was necessary because it was something new we knew nothing about. It was like one day here’s this, take the test and, boom, take the truck. I don’t think it was enough. But nothing happened negatively because I wasn’t trained properly. It just seemed like it came too quick.” One CNG operations manager believed that “the problem is that the ones you train aren’t necessarily going to be the ones who drive those trucks exclusively. We have a route coverage structure. I think if you have the CNGs you should train every single employee to be familiar with what reading he needs before he takes the vehicle out and how to take that reading. You can’t just train a handful of people.”

While the training to drive and recharge the electric vehicles was perceived as informal, it was also perceived as enough by the couriers. Only one courier interviewed at Culver City could recall “a little training,” but the majority remembered their introduction as “they came in one day and said these are the

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CleanFleet, here's your key. I never read any information on them. I absolutely know nothing about them, to be honest with you." In fairness, though, these couriers did not feel as though they had missed anything because "we didn't have to do anything different." Operations managers, on the other hand, disagreed. Claiming that he had no training, one manager said: "I think I would have been more comfortable if I knew how it operated. I didn't have the slightest idea how it operated." A second operations manager added, "I think for a company, there should be more training for those using them. We train to drive the Grummans. I think it would go over a lot better and people would be more comfortable. Believe me, the last thing you want to worry about when you have a truck full of freight is that your truck isn't going to make it and you can't deliver it."

While only one courier desired more education about the propane gas vehicles, several had a variety of opinions and suggestions about CleanFleet training. The main recommendations were that "we could have learned more about fueling the vehicle" and "every now and then we had a problem if you had to switch vans with somebody on road. If the other person wasn't propane gas trained, then they couldn't drive the vehicle. So that was a problem, a real hassle. Everybody should be trained at one time." This concept was discussed with an operations manager who countered, "It did cost us. We had to train every single person with the propane gas video and test and everything. An hour to an hour and a half for every person who ever touched one of them. Just in training."

Corroborating the questionnaire data, most M-85 couriers basically were satisfied with the amount of information they received. Two couriers mentioned that "I'd like to have a little more insight... as far as health and safety."

In general, handlers and mechanics regarded the training as minimal but adequate. Both CNG mechanics added, "They gave us very little information; almost absolutely no training. If we had a problem, we were to send it out to the dealer. Now that the program is over, they have just kind of dumped everything in our laps. We're to take care of them on our own...and we'll need a lot more training."¹¹

Again, the introduction of RFG at Los Angeles was perceived as "transparent" with no additional training required.

Communications

In general, the informal "grapevine" within each of the five CleanFleet stations indicated that there was a casual consensus about the employees' experience with "their" alternative fuel. When asked whether a more formal and consistent communications program would have helped during the CleanFleet demonstration, one CNG courier put it this way: "I really didn't think too much about it. I just need a vehicle. In my case, I just thought it was another progressive thing that Federal Express was doing. But I don't think it would have made any difference if they had gone into it in more detail." Other couriers voiced the opposite opinion as "I was glad to have a control vehicle to begin with, because you do hear feedback and there seemed to be a negative initially as far as the power aspect of it" and "just running out of fuel was the biggest

¹¹ Maintenance on the CNG vehicles continues to be supported by the vehicle manufacturers until the vehicles are disposed of or permanently designated for FedEx operations.

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problem I've heard. They didn't like them right away because of that. It made a bad impression on everybody. It probably would have been helpful in the beginning (to share experiences). A pain in the neck, too, but helpful to find out if they're having the same problems. Maybe different problems." During one focus group, a courier captured the feeling of approximately half of the courier population with "I'm glad you're doing this [a focus group]. If they had done it in the first place, they wouldn't have had so many problems."

A courier driving the electric vehicle commented that "a couple of people have come up to me and said they wouldn't drive that thing. But it's my vehicle. It's nice and clean. I don't have to worry about other people using my truck and making a mess of it." Only one RFG courier at Los Angeles, out of all five stations, appeared to be aware of attempts to keep the employees informed about the progress of the CleanFleet, remarking that "we've had the updating. We have our poster downstairs to keep us updated...of the findings of the vehicles they've taken out."

One Rialto courier expressed a special interest in the program, commenting that "I think it should be corporate wide, not just the five stations. Every station should see the results of this. This is world-wide. It would be good to hear a little about it on one of the FrontLines." *Would you have liked more communication during the program?* "It wasn't necessary. You have to wait 'til the tests come out to see how it's going anyway. All the questions can be asked later." M-85 couriers at Santa Ana also voiced their desire for more information as "it would have been nice to have updates here and there on performance, if there was something new. What to look for in terms of being able to report. They could have updated us if anybody else had safety concerns. More contact with the program management."

Without exception, all FedEx employees indicated that they would be interested in and would like to see a synopsis of the results of the CleanFleet demonstration.

Personal Commentary

In addition to the assessment of safety, health, and vehicle performance issues, the employee attitude assessment study also explored the FedEx CleanFleet employees' personal reactions to the demonstration program from several points of view.

General Program Reactions

By an overwhelming margin, FedEx employees felt pride and enthusiasm about the CleanFleet demonstration program. For most, it was a good experience and certainly considered worthwhile. It appeared that electric, CNG and, to a lesser extent, propane gas engendered the most involvement and interest as alternative fuels. However, this observation could have been influenced by the individual station cultures.

One courier's statement mirrored the general tenor throughout the five stations: "Oh, it felt good knowing that we are a test station to run something like that, that concerns our future as far as having better air. It felt good that Federal Express as a whole was a test bed. It's encouraging. I think the public should know all this information and that somebody is out there, concerned about it. It's people, like you and me, who have to live and work in this air. That someone has taken the time and their resources and letting the government know there's a problem out here and we want to do something."

Benefit Assessment

The dominant sentiments expressed by the couriers at all five stations say it all:

- "Even if it proves that it isn't a cleaner burning fuel, I think it was still worth the test."
- "I'd say yes, it was worth the inconveniences, because smelling the exhaust fumes of gasoline..."
- "I think it's a good, positive step forward in finding alternatives. Not knowing much about it, it was interesting."
- "Because we all want cleaner air. This is a way to get it. I've been in California all my life. I know we're getting better with it. If we can bring the technology up to where these are reliable, it's a great deal."
- "It does make me feel better that I know that I'm not contributing to the air pollution. I'm not dumping as much pollution in the air as everybody else. ...There's really no difference. It's just nice to know there's not as much pollution."

Station Conversion

A review of the questionnaire data shown in Table 13 indicates that, even with the articulated support for alternative fuels, only RFG had a majority in favor of station conversion.

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Table 13. Station Conversion

“I believe FedEx should consider converting my station entirely to the alternative fuel we tested.”

Station: <i>Fuel</i>	Strong Agree	Agree	No Opinion	Disagree	Strong Disagree
Irvine: <i>CNG</i>	13%	21%	10%	29%	27%
Los Angeles: <i>RFG</i>	30%	20%	30%	10%	0%
Rialto: <i>propane gas</i>	13%	19%	23%	10%	36%
Santa Ana: <i>M-85</i>	13%	25%	38%	13%	6%
AVERAGE	14%	21%	20%	19%	24%

Focus group and interview responses, however, indicate a much stronger endorsement for station conversion in every one of the five fuels, with the proviso that the fuel system’s performance problems and limitations can be resolved. Then, too, in a public forum, a pro-environment response is more acceptable. During the one-on-one interviews, operations managers and mechanics had the most serious reservations, which were epitomized by: “I’d like to see the program stay, but I’d like to have more reliable equipment.” As one M-85 operations manager put it, “I’m not sure, but I think conversion would be a hard sell. These people know how a vehicle is supposed to drive. I think the majority of the surveys will show that. They want a vehicle to perform, especially when it’s part of their job.” As noted earlier in this report, one CNG operations manager actually voiced disapproval of station conversion given the current level of technology.

Would You Consider Driving an AFV as Your Personal Car?

Results indicate that, on average, more FedEx CleanFleet participants would depend more on the alternative fuel they tested for their own personal use than in their professional work, by a margin of 9 percent. Printed questionnaire responses provided the following quantitative data (Table 14).

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Table 14. AFV Personal Driving Preference

“I would consider driving a passenger vehicle that runs on this alternative fuel for my personal car.”

Station: Fuel	Strong Agree	Agree	No Opinion	Disagree	Strong Disagree
Irvine: CNG	13%	29%	19%	23%	17%
Los Angeles: RFG	10%	30%	20%	10%	0%
Rialto: propane gas	23%	19%	23%	7%	29%
Santa Ana: M-85	19%	38%	31%	13%	0%
AVERAGE	16%	28%	22%	15%	16%

Yet, individual comments most often heard during the interviews and focus groups are a familiar refrain:

- “I don’t know. I wouldn’t know where to get fuel for it; that would be a problem.”
- “I wouldn’t particularly want to buy one for my personal use because of the short driving distance.”
- “I would love natural gas for my car. It’s cheaper, it’s economical. It’s a good product. ...As far as natural gas for my own car, it runs much smoother.”
- “I don’t think I would want one. I drive a sports car.”
- “Oh yes, definitely. I’d take one of those in a second. As long as I could afford the electrical bill.”
- “If the (fuel) setup was readily available; it’s not now.”
- “I believe any clean fuel vehicle is good, but if I could get a personal clean vehicle, I would. And I would like the comforts... If it can just be as reliable as gas, I think it would be great. Especially if the fuel is cheaper, I would consider buying an alternative fuel vehicle personally. If it could stay around the dollar range; it would lessen our dependency overseas.”
- “...If it was just as abundant as gasoline, yeah.”
- “If it was more economical than gasoline, sure.”
- “Yeah, if it weren’t too expensive and available. Affordable and comparable, if it cuts down on smog.”

EMPLOYEE ATTITUDE ASSESSMENT

Recommendations

Obviously, all employees enjoyed having new vehicles in their fleet. Although a strong showing of opinions were expressed regarding station conversion, as shown above, most participants deferred making an outright recommendation. They acknowledged that conversion and purchase decisions encompass multiple considerations: “Well, I’d have to have more information. Is it more economical for the company? I know it’s better for the environment. If it’s profitable for the company, then I’d say this is a perfect situation.” Or, “I believe in the program, I believe in what we’re trying to do. As long as it’s cost-effective.”

In summary, most “advice” captured the general tenor of attitudes and opinions expressed throughout this assessment study:

- “Good job for doing it.”
- “Don’t stop here. We have the vehicles.”
- “Keep up in the positive direction, as far as getting away from fossil fuels and a better burning engine. If there’s anything we can do to help the manufacturers with this. It’s about breathing good air once again.”

APPENDIX A

Printed Questionnaire

Attitude Assessment Survey

We appreciate your time and attention to complete the following Questionnaire. Please be as candid and accurate as possible (all responses are anonymous). There are no "right" or "wrong" answers. Your opinion is important! (If a question does not apply to you or your position with FedEx, please leave that question blank.)

PART I: BACKGROUND INFORMATION

1 What is your current position with FedEx?

- ⁵⁻¹ ☐ Senior Station Manager
- ⁻² ☐ Operations Manager
- ⁻³ ☐ Courier
- ⁻⁴ ☐ Mechanic
- ⁻⁵ ☐ Refueler

2 How long have you been employed by FedEx in your *current* position at *this* station?

- ⁶⁻¹ ☐ Less than 1 Year
- ⁻² ☐ 1-2 Years
- ⁻³ ☐ 2-5 Years
- ⁻⁴ ☐ Over 5 Years

3 How long have you been involved in the CleanFleet Demonstration Project?

- ⁷⁻¹ ☐ Less than 6 Months
- ⁻² ☐ 6-12 Months
- ⁻³ ☐ 12-30 Months

4 What is your age? (Optional)

- ⁸⁻¹ ☐ Under 21 years
- ⁻² ☐ 21-25 years
- ⁻³ ☐ 26-30 years
- ⁻⁴ ☐ 31-35 years
- ⁻⁵ ☐ Over 35 years

5 Was this program your first experience working with an Alternative Fuel Vehicle? ⁹⁻¹ ☐ Yes ⁻² ☐ No

If **NO**, please describe which fuel and your previous experience _____

(Please continue to next page...)

EMPLOYEE ATTITUDE ASSESSMENT

PART II: ALTERNATIVE FUEL AND VEHICLE EXPERIENCE

These questions relate to your **personal experience** with the alternative fuel and vehicles you worked with during the CleanFleet Demonstration (April, 1992 to date). **[AFV means the Alternative Fuel Vehicle(s) you drove, managed, or maintained.]**

6 Which vehicles did you work with during this time? (Please check ALL MODEL(s) that apply)

	FUEL	CHEVROLET	DODGE	FORD	G-VAN (Lead Acid)	G-VAN (Nickel Cadmium)
10-	CNG at APV	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>		
11-	RFG at EMT/SPQ	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>		
12-	Propane at RIV	-1 <input type="checkbox"/>		-2 <input type="checkbox"/>		
13-	M85 at SNA			-1 <input type="checkbox"/>		
14-	Electric at CCD				-1 <input type="checkbox"/>	-2 <input type="checkbox"/>
15-	Unleaded (Control)	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>		

7 During the CleanFleet Demonstration, did you experience a *safety-related* problem that was *due to the Alternative Fuel*?

16-1 ☐ Yes -2 ☐ No

If Yes, please indicate what problems you experienced. (Check *all* that apply)

- | | | | |
|-----|---|----------------------------------|---|
| 17- | Leaking Fuel or Spillage | -1 <input type="checkbox"/> Once | -2 <input type="checkbox"/> Two or more times |
| 18- | Fire | -1 <input type="checkbox"/> Once | -2 <input type="checkbox"/> Two or more times |
| 19- | Excessive Noise | -1 <input type="checkbox"/> Once | -2 <input type="checkbox"/> Two or more times |
| 20- | Braking | -1 <input type="checkbox"/> Once | -2 <input type="checkbox"/> Two or more times |
| 21- | Other (Please be as specific as possible) _____ | | |

8 During the CleanFleet Demonstration, did you experience a *health-related* problem that was *due to the Alternative Fuel*?

22-1 ☐ Yes -2 ☐ No

If Yes, please indicate what problems you experienced. (Check *all* that apply)

- | | | | |
|-----|---|----------------------------------|---|
| 23- | Bothered by Fuel Vapors | -1 <input type="checkbox"/> Once | -2 <input type="checkbox"/> Two or more times |
| 24- | Bothered by Exhaust Emissions | -1 <input type="checkbox"/> Once | -2 <input type="checkbox"/> Two or more times |
| 25- | Eye Irritation | -1 <input type="checkbox"/> Once | -2 <input type="checkbox"/> Two or more times |
| 26- | Skin Irritation | -1 <input type="checkbox"/> Once | -2 <input type="checkbox"/> Two or more times |
| 27- | Headaches | -1 <input type="checkbox"/> Once | -2 <input type="checkbox"/> Two or more times |
| 28- | Other (Please be as specific as possible) _____ | | |

9 If you worked with BOTH a CleanFleet AFV and a Control Vehicle FROM THE SAME MANUFACTURER, which Vehicle Model did you work with the *most often*? (If you did not work with an AFV and Control Vehicle from the same manufacturer, please go to Question 10.)

- 29-1 ☐ Chevrolet
30-1 ☐ Dodge
31-1 ☐ Ford
32-1 ☐ G-Van (Lead Acid)
33-1 ☐ G-Van (Nickel Cadmium)

(Please continue to next page...)

If **YES** to Question 9, and thinking about the Vehicle Model you checked above (Chevrolet, Ford, or G-Van), what is your opinion of this AFV?

	WORSE THAN CONTROL VEHICLE	ABOUT SAME AS CONTROL VEHICLE	BETTER THAN CONTROL VEHICLE
34- Overall Impression	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>
35- Mechanical Operation	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>
36- Ease of Refueling	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>
37- Manufacturer Support	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>
38- Vehicle Maintenance	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>
39- Vehicle Reliability	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>
40- Level of Technology	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>
41- Other _____	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>

10 If you worked with the **SAME ALTERNATIVE FUEL** in models of **DIFFERENT MANUFACTURERS** (Ford CNG and Dodge CNG, or Chevy Propane and Ford Propane, for example), which model did you prefer? (If you did not drive different models using the same Alternative Fuel, please go to Question 11]

- 42-1 ☐ Chevrolet
 43-1 ☐ Dodge
 44-1 ☐ Ford
 45-1 ☐ G-Van (Lead Acid)
 46-1 ☐ G-Van (Nickel Cadmium)

Why did you prefer this AFV model more than the other model(s)? (Check *all* that apply)

- 47- ☐ Overall Impression
 48- ☐ Mechanical Operation
 49- ☐ Ease of Refueling
 50- ☐ Manufacturer Support
 51- ☐ Vehicle Maintenance
 52- ☐ Vehicle Reliability
 53- ☐ Level of Technology
 54- ☐ Other _____

11 How did working with AFVs and the CleanFleet experience at your station affect your work?

	POSITIVELY	NO CHANGE	NEGATIVELY
55- Overall Productivity	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>
56- Job Satisfaction	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>
57- Meeting Schedule	-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>

12 How many *hours per week* did working with the AFVs add to your normal work load? 58-1 ☐ 0-1 -2 ☐ 2-5 -3 ☐ 5-9 -4 ☐ 10 or more

(Please continue to next page...)

EMPLOYEE ATTITUDE ASSESSMENT

		STRONGLY AGREE	AGREE	NO OPINION	DISAGREE	STRONGLY DISAGREE
13	I was given all the information/training I needed to work effectively with AFVs.	59-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>	-4 <input type="checkbox"/>	-5 <input type="checkbox"/>
14	During the CleanFleet Program, I was able to meet my regular schedule without interruption.	60-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>	-4 <input type="checkbox"/>	-5 <input type="checkbox"/>
15	Before the Program, I had some <i>safety</i> concerns about these vehicles.	61-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>	-4 <input type="checkbox"/>	-5 <input type="checkbox"/>
16	I still have some <i>safety</i> concerns about AFVs.	62-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>	-4 <input type="checkbox"/>	-5 <input type="checkbox"/>
17	Before the Program, I had some <i>performance</i> concerns about these vehicles.	63-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>	-4 <input type="checkbox"/>	-5 <input type="checkbox"/>
18	I still have some <i>performance</i> concerns about the AFVs.	64-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>	-4 <input type="checkbox"/>	-5 <input type="checkbox"/>
19	I believe FedEx should consider converting my station entirely to the Alternative Fuel we tested.	65-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>	-4 <input type="checkbox"/>	-5 <input type="checkbox"/>
20	I would consider driving a passenger vehicle runs on this Alternative Fuel for my personal car.	66-1 <input type="checkbox"/>	-2 <input type="checkbox"/>	-3 <input type="checkbox"/>	-4 <input type="checkbox"/>	-5 <input type="checkbox"/>

PART III: COMMENTS

Please take a few more minutes and share any additional thoughts, concerns, or recommendations you would like to make regarding the FedEx CleanFleet Demonstration Program. (Attach a separate sheet of paper, if necessary.)

If we have a question about your responses, may we contact you for clarification? If yes, please provide your name and Employee Number. This information is completely *optional and confidential*. Your name and employee number will not be revealed in any report!

NAME _____ EMPLOYEE NUMBER _____

Thank You Very Much for Your Cooperation and Help!

APPENDIX B

Interview and Focus Group Format

INTERVIEW

POSITION:

Station:

DATE: November , 1994

Thank you for participating in this interview. While all the data and statistics are being compiled and analyzed, FedEx and the CleanFleet Sponsors recognize that one of the most important elements is the people who worked with these vehicles. You have been selected because of your experience with and contribution to this Demonstration Program.

1. Have you completed the Questionnaire? If *YES*... Should any questions been asked that weren't?
2. Which vehicle models did you work with?

CCD (ADD): Did you work with G-Vans fitted with **lead-acid batteries** or **nickel-cadmium batteries** or **both**?

CCD (CLARIFY whether **lead-acid batteries** or **nickel-cadmium batteries** or **both**...)

3. What, if any, are the *Positive Characteristics* of the AFVs? ...environment and air quality improvement? ...performance? ...what did you like about the AFVs?
4. What, if any, are the *Negative Characteristics* of the AFVs? ...performance (e.g. speed, handling, acceleration)? ...dependability (e.g. could you meet schedule, did the vehicle impede you in any way)? ...what did you not like about the AFVs?
5. How did the vehicles perform compared to the Control Vehicle of the same manufacturer? (Separate by model, by battery type) ...ease of operation? ...Acceleration? ...Braking? ...Steering/Handling? ...Comfort? ...Morning start-up? ...Smoothness (first 10 minutes)?
6. What, if any, *technology improvements* would you like to see?
CCD (ADD): What are the *Significant Differences* between the battery types?
7. How do the AFVs you drove compare with the equivalent Control Vehicles *in this application*? ...Range? ...Fuel Economy? ...Stop and start?
8. Can you suggest improvements in the *maintenance* of the vehicles?
9. What, if any, *operations issues* were not addressed?
10. Did you receive any/enough *training/information* to work with these vehicles effectively?
11. What, if any, were your *safety concerns*? Did you share these concerns with management? ...with each other? Were they addressed during the Program?
12. What would make these vehicles more satisfactory for *this application*? ...for *other or general application*?
13. Did you have any *health concerns* or negative effects?

EMPLOYEE ATTITUDE ASSESSMENT

14. What is your *personal reaction* to participating in the CleanFleet Demonstration (pride, anxiety, involvement...)
15. What, if any, were the benefits of the CleanFleet program?
16. Can you suggest improvements/additional testing recommended in programs such as the CleanFleet program?
17. Are you aware of the other station experience with the other fuels in the CleanFleet Program?

POSITION: **Operations Managers** [ADD]

What, if any, were the disruptions to operations due to the CleanFleet Program? Extra effort required? Data collection activities? Any undue hardship, e.g. refueling? Were these situations the result of the “newness” of the routine or were they resolved as the Program progressed and became more mature? What were the comments you heard from each of your constituencies? Did the Program impact morale? ...individual or station productivity? ...budget?

POSITION: **Mechanics** [ADD]

Parts availability? OEM support? What do you think about the basic technology? Reliability? Maintenance issues? Safety? Were you provided proper tools? Training? What would you change?

POSITION: **Refuelers** [ADD]

Safety issues? Exhaust or fumes? Is refueling equipment satisfactory? Do you recommend any vehicle changes to facilitate refueling?